Docket No.: 713-488 PATENT

In re Application of :

Ian Karl JONES :

Serial No. Not yet assigned : Group Art Unit: Not yet assigned

Filed: April 5, 2001 : Examiner: N/A

For: PROTECTIVE PACKAGING SHEET

CLAIM OF PRIORITY AND
TRANSMITTAL OF CERTIFIED PRIORITY DOCUMENT

Assistant Commissioner For Patents
Washington, D.C. 20231

Dear Sir:

In accordance with the provisions of 35 U.S.C. 119, Applicant hereby claims the priority of:

Great Britain Patent Application No. 0008538.1 filed April 6, 2000

cited in the Declaration of the present application.

The certified copy will be submitted in due course.

Respectfully submitted,

LOWE HAUPTMAN GILMAN & BERNER, LLP

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Date: April 5, 2001

The Patent Office
Concept House
Cardiff Road
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South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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Signed Andrew Gerry

Dated 14 March 2001

Patents Form 1/77

Patents Act 1977
(Rule 16)

The Patent Office

-6 APR 2000

1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP9 1RH

1. Your reference — SNR06817GB

2. Patent application number *(The Patent Office will fill in this part)* — **0008538.1** — -6 APR 2000

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

ITW Limited
PO Box 87
Queensway
Fforestfach
Swansea
SA5 4ED

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation — 5275C7006

4. Title of the invention — PROTECTIVE PACKAGING SHEET

5. Name of your agent *(if you have one)* — Gill Jennings & Every

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Broadgate House
7 Eldon Street
London
EC2M 7LH

Patents ADP number *(if you know it)* — 745002

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

YES

PROTECTIVE PACKAGING SHEET

This invention relates to packaging materials and in particular, though not solely, to embossed sheet material used in packaging heavy loads such as large metal coils or rolls or stacks of rectangular cut sheet metal.

In order to avoid or minimise damage to heavy loads such as cold rolled steel coils during transportation and storage, specialised packaging solutions are required. In the case of steel coils, the extreme weight (up to around 20 tonnes) over a surface contact area as small as $0.5m^2$ makes it difficult to meet the desirable requirement of maintaining separation between the ground and the steel to avoid corrosion during storage. The packaging material should also be puncture resistant, have a high impact strength and resistance to compression under the weight of a coil. It would also be beneficial for the packaging material to be recyclable, cheap to produce and manageable (light weight and easily worked into position around a coil).

Currently, there are a number of alternative materials used in packaging steel coils. Some manufacturers package their steel coils in steel or hard fibre hardboard, usually held together with steel straps. The steel coil may be (but is not always) shipped on a wooden pallet either with the axis of the coil vertical or horizontal. Some steel coils are wrapped in sheets of paper, such as kraft paper, plastics stretch wrap or a tear resistant plastic material (such as polyethylene or polypropylene) having one or more layers, sometimes with at least one layer being impregnated with a corrosion inhibitor (see for example US-A-5983598). However these materials offer insufficient protection and padding beneath the steel. Laminated polyethylene/ polypropylene (see for example US-A-5928770) has also been suggested as a packaging material for steel coils however the manufacturing costs for this material would be prohibitive.

between the front and rear surfaces of the packaging sheet is less than or equal to about 5 times the thickness of the thermoplastics sheet from which it is formed.

Preferably the gaps between the shaped protuberances are filled with insulating foam.

Preferably a thin sheet is laminated to the furthermost projecting sections of either or both of the front and rear surfaces.

Preferably the at least one intermediate layer is filled with insulating foam.

Particular embodiments of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is a plan view from above of a portion of the protective packaging sheet according to a particular embodiment of the present invention;

Figure 2 is a plan view from below of the protective packaging sheet shown in Figure 1;

Figure 3 is a cross-sectional side elevation of the protective packaging sheet of Figure 1 through the line A-A;

Figure 4 is a cross-sectional side elevation of the protective packaging sheet of Figure 1 through the line B-B;

Figure 5 is a schematic flow diagram showing the main steps in producing the protective packaging sheet of Figure 1;

Figure 6 is a cross-sectional view similar to Figure 3 through a packaging sheet according to an alternative embodiment of the present invention;

Figure 7 is a cross-sectional view similar to Figure 4 through the packaging sheet of Figure 6;

Figure 8 is a cross-sectional view similar to Figures 3 and 6 through a packaging sheet according to a further alternative embodiment of the present invention; and

Figure 9 is a cross-sectional view similar to Figures 4 and 7 through the packaging sheet of Figure 8.

Although not essential, it has been found that the physical properties (for example resistance to bending and increased rigidity) of the packaging sheet are improved by providing connecting webs 6 between adjacent shaped protuberances 5. The shaped protuberance 5 could also be considered to include the connecting webs. Effectively, the connecting webs resist bending of the packaging sheet by resisting compressive or tensile forces acting along them. Accordingly, it is preferred that some connecting webs be provided at least both in a lateral direction and also in a direction perpendicular to the lateral direction. It can be seen in the cross-sectional views of Figures 3 and 4 that the connecting webs extend only substantially midway between the front 2 and rear 3 surfaces and thereby form a middle level between the two surfaces.

As previously mentioned, the embodiment shown in Figures 1 to 4 has been designed so that it may be used with either surface contacting the load to be packaged. This avoids accidental incorrect usage of the packaging sheet and is possible because the contact surface area of the front and rear surfaces is about the same and has been achieved by the combination of the spacing, size and juxtaposition of the shaped protuberances 5. As the connecting webs 6 do not project out from the surface of the sheet as far as the "T" shaped protuberances, they do not contribute to the contact surface area of either front or rear surface.

The stiffness of the packaging sheet according to the invention is much greater than the stiffness of the plastics sheet from which it is formed. This is in part due to the connecting webs but mainly due to the positioning of the shaped protuberances 5. It has been found that positioning the shaped protuberances 5 such that any straight line (a potential crease, tear or bending line) must cut through the shaped protuberances (in addition to the gaps between the shaped protuberances) increases the resistance of the packaging sheet to bending. This is

cooling or breaking during deformation. Where the plastics sheet is formed "on site" it is anticipated that the sheet will be sufficiently heated during formation to allow suitable moulding to take place without the need for additional heating. It has been found that the thickness of the finished packaging sheet should be less than or equal to about 5 times the thickness of the plastics sheet from which it is formed, any thicker and the desired structural properties are not maximised and there is a risk of damaging the plastics sheet.

Once heated, the plastics sheet is then passed between two embossing rollers 22 and 23 which rotate in opposite directions. At least one of the embossing rollers is provided with a solid embossed surface pattern while the other roller may either be provided with the inverse solid embossed surface pattern (that is, male and female rollers to produce a packaging sheet with an embossed pattern and a constant cross-sectional thickness), a solid cylindrical surface or may be covered in a soft "rubberised" material which will effectively deform to the contours of the embossed roller to follow the embossed roller's pattern. Accordingly, the packaging sheet may be produced with only one side embossed and the other flat (which is not preferred as the sheet then has a preferred orientation), both sides embossed with different patterns or both sides embossed with one side being the inverse of the other.

As the embossing rollers are operated their temperature will increase and it may be necessary to provide a cooling system to the rollers to keep them within a suitable operating range. The preferred operating temperature range of the embossing rollers 22 and 23 is below the temperature of the plastics sheet 20 so that the plastics sheet is cooled and the pattern "frozen" into the plastics sheet upon contact with the rollers.

The width of the plastics sheet and the packaging sheet formed therefrom could be the same as the width of embossing rollers 22 and 23. Alternatively, the length of

In order to further improve the thermal resistance and structural properties of either embodiment of the packaging sheet, a thin plastics (for example polyethylene or polypropylene) sheet 31, 32 could be laminated to either the front and/or rear surface thereby trapping a layer of substantially stagnant air between the packaging sheet and the thin plastics sheet(s) as shown in Figures 8 and 9. Alternatively the space between the sheets could be filled with a suitable insulating foam. A further alternative is shown in Figures 6 and 7 without the additional thin plastics sheet but wherein insulating foam 30 fills the depressions in surface 3 of the packaging sheet so that surface 3 is now effectively flat. Of course, the depressions in surface 2 could alternatively or additionally be filled with foam to flatten surface 2.

By including a flat surface, these embodiments provide a convenient surface on which information or advertising may be printed. Furthermore, by trapping air or foam between the embossed sheet and the thin laminated sheet, the compression and impact resistance and thermal insulating properties of the packaging sheet are improved.

Accordingly, at least in the particular embodiments described, the present invention provides a lightweight, durable, rigid and tough packaging material. The packaging sheet according to some embodiments of the invention may also easily be cut and is recyclable.

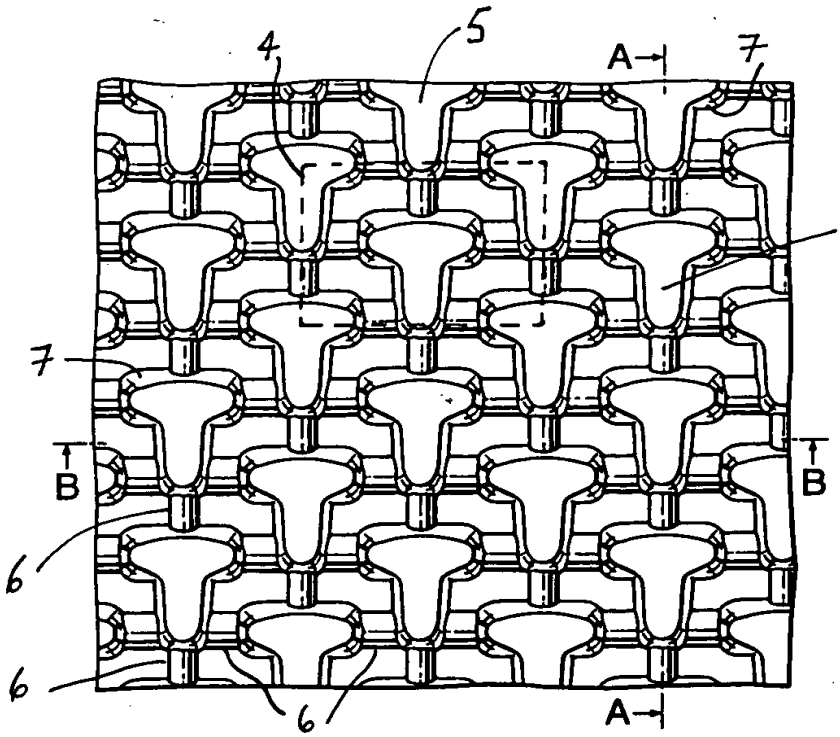


FIG 1

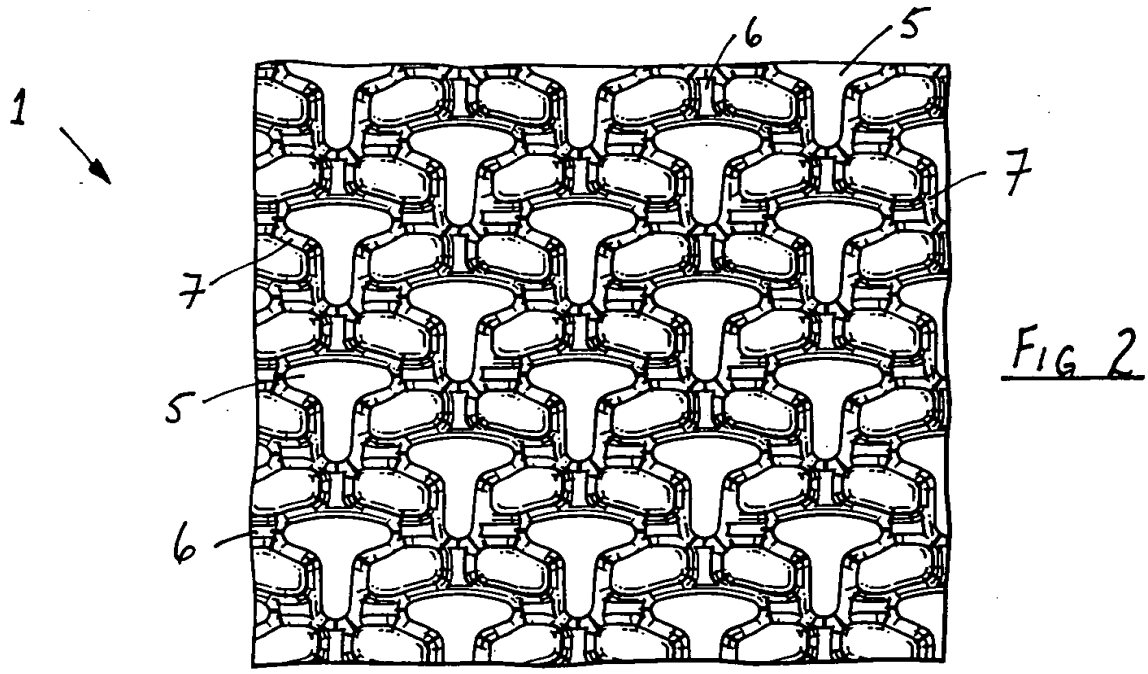


FIG 2

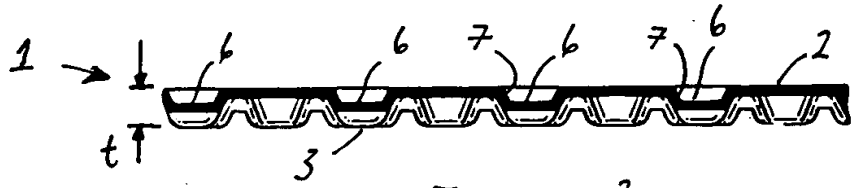


FIG 3

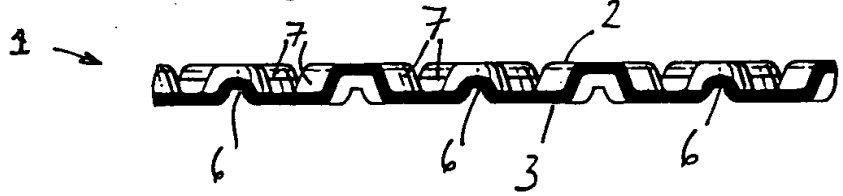
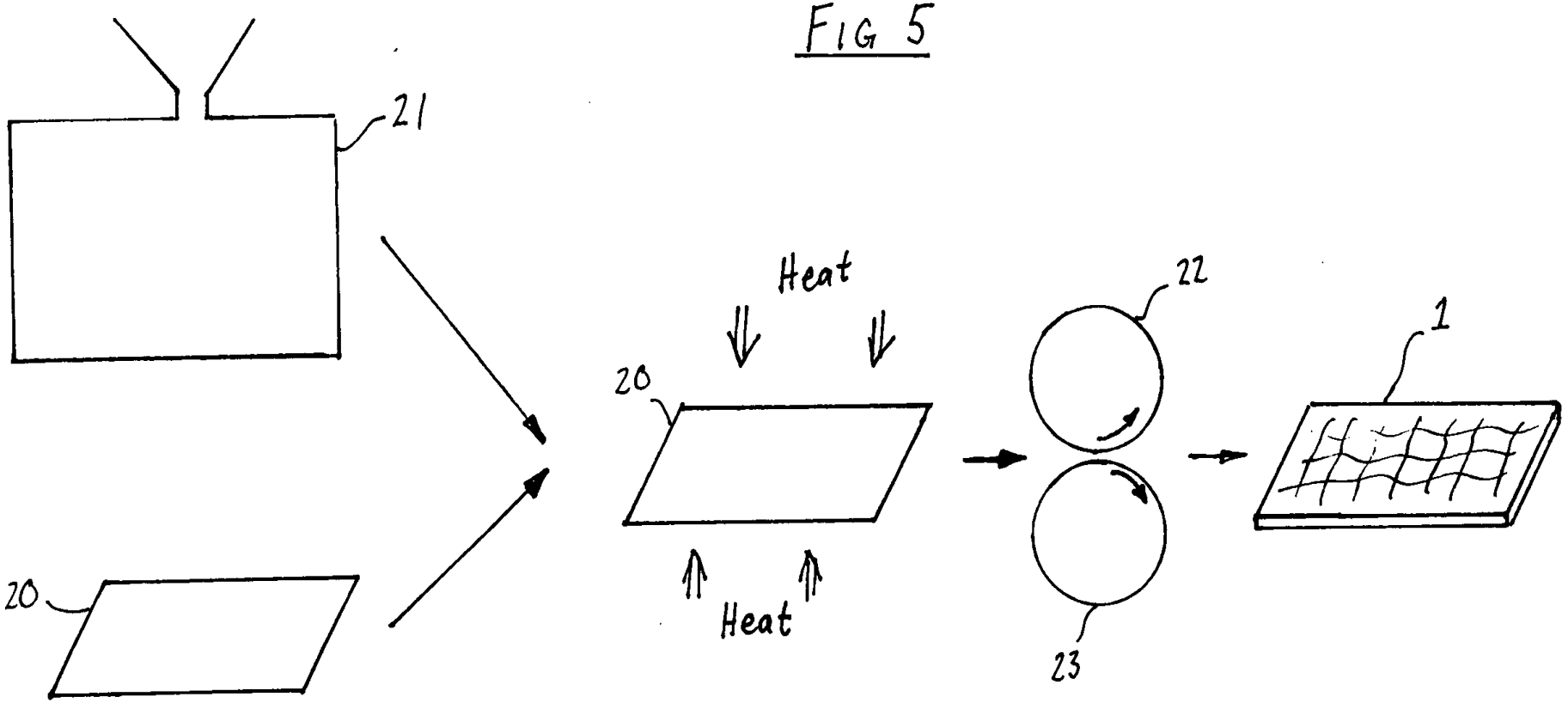


FIG 4

FIG 8

FIG 9

FIG 5



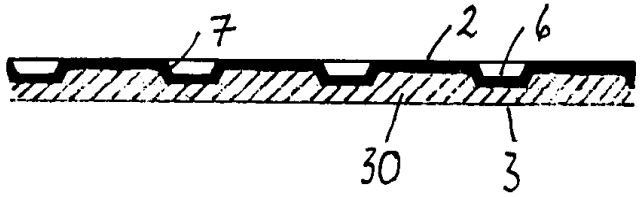


FIG 6

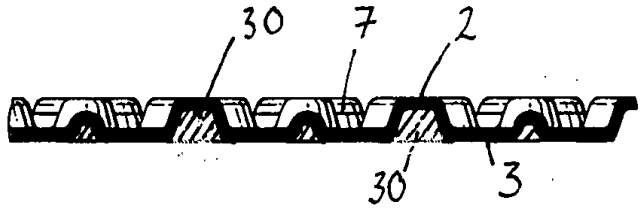


FIG 7